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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/782,886	02/13/2001	Alexandre Blais	M-8676 US	3344
20583	7590	07/13/2004	EXAMINER HU, SHOUXIANG	
JONES DAY 222 EAST 41ST ST NEW YORK, NY 10017			ART UNIT 2811	PAPER NUMBER

DATE MAILED: 07/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/782,886

Applicant(s)

BLAIS, ALEXANDRE

Examiner

Shouxiang Hu

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4 and 7</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Objections

1. Claims 1-10 are objected to because of the following informalities and/or defects:

Claims 1-5 fail to clarify: based on what basic quantum circuit structure(s) the recited operations are implemented for the recited quantum computation; what are the functions of the recited first and second series of operations; whether the recited method is a method of operating a quantum device or a method of designing a method of operating a quantum device; whether the first series of operations is actually implemented in the recited quantum computation; whether the recited swap operation is definitely eliminated or included in the recited method.

Claims 6-10 fails to clarify: based on what basic quantum circuit structure(s) the recited operations are implemented; what are the respective functions of the recited sequence of operations and the recited two operations that commute; how the recited two operations can also be performed simultaneously when they are already defined as sequenced and completed operations in the recited sequence of operations; what are the exact definition of the operations: Z, X, and/or CP.

In claim 10, the term of "claim 6" should read as: --claim 7 (or 9)--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 5, as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 102(a) as being anticipated by Saito et al. ("Saito", Actual computational time-cost of the Quantum Fourier Transform in a quantum computer using nuclear spins, Los Alamos National Laboratory, preprint quant-ph/0001113, 2000; of record).

Saito discloses a method for a quantum computation (see Figs. 1 and 2, also see the right column on page 3), comprising: constructing a first series of operations on qubits that perform the quantum computation (see Fig. 2a); and constructing a second series of operations (see Figs. 2b and/or 2c) from the first series by changing an execution order of the operations that naturally mutually commute, which naturally reduce the time required for a quantum computing device to complete the second series of operations, and it thus naturally reduces the required coherence time for the computation.

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Regarding claim 5, the originally required swap operations in Saito are reduced (see Fig. 2b), or eliminated at least in the last several steps in Fig. 2b or fully eliminated in Fig. 2c.

4. Claim 6, as being best understood in view of the claim objections above, is rejected under 35 U.S.C. 102(b) as being anticipated by Griffiths et al. ("Griffiths"; Semiclassical Fourier Transform for Quantum Computation, Phys. Rev. Letters, Vol 76, No. 17, April 1996; of record).

Griffiths discloses a method for performing a swap operation in a quantum computing device (see Fig. 1), the method comprising: performing operations from a sequence of operations (the operations "2" and "3" on the left side of operations shown in Fig. 1); and simultaneously performing two of the operations (the operations "2" and "4" at the middle of Fig. 1) that naturally commute.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-4, as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Griffiths in view of Saito.

The disclosures of Saito and Griffiths are disclosed as applied to claims 1, 5 and 6 above.

Although Griffiths does not expressly disclose that the method can further comprise the step of constructing the second series of operations from a first series by changing an execution order of the commuting operations therein, Saito teaches that such order-change step is desirable to simplify the operations (see Figs. 1 and 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the order-change step of Saito into the method of Griffiths, so that a method with simplified operations would be obtained.

7. Claims 7-10, as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Griffiths in view of Applicant Admitted Prior Art ("AAPA")

The disclosure of Griffiths is disclosed as applied to claim 6 above.

Griffiths does not expressly disclose that the method can further comprise the steps of performing the recited $Z_r(\pi/2)$, $X_s(\pi/2)$ and/or $CP_{rs}(\pi/2)$ operations. However, as evidenced in AAPA (see Paragraph [0036] of the instant specification), these operations are art-known for performing Quantum Fourier Transform. And, individual steps or operation sequences are art-recognized parameters of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the method of Griffiths with the recited $Z_r(\pi/2)$,

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$X_s(\pi/2)$ and/or $CP_{rs}(\pi/2)$ operations being included, as taught in AAPA, so that a method capable of Quantum Fourier Transform would be obtained.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References A and B are cited as being related to a quantum computation method.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH

7/7/04



SHOUXIANG HU
PRIMARY EXAMINER